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Metal-Plastic Composite Targets for Instability Studies on Nova

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Abstract

This paper describes a novel fabrication technique used to construct laser targets for an experimental program at Lawrence Livermore National Laboratory (LLNL) that studies Rayleigh-Taylor instability and thin-shell ablation instability. The Rayleigh-Taylor instability occurs when a heavy fluid is accelerated by a lighter fluid. Hydrodynamic growth of the perturbations at the interface is of scientific interest to rigorously test compressible instability models. Thin-shell ablation behavior has direct relevance to the design of fuel capsule for inertial confinement fusion. Target construction extends the proven scheme employed to construct gold hohlraum for Nova indirect-drive experiments. The uniqueness of the new process--where direct machining of the Nova target is not feasible--is to closely replicate features that has been precisely diamond-machined onto a copper substrate. In this case, replication is accomplished by vapor depositing titanium or aluminum onto the substrate yielding a stress-free coating up to 50 μm thick. In addition, this paper presents the characterization methods used, describes a typical experimental set-up, and gives a sampling of the test results.

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